REMARKS

Applicant respectfully requests reconsideration of this application as amended. Claims 1-3, 5-16, 18-21, 23-46, 48-53, 55-60, 62-67, 69-72, and 74-75 remain in this application. No claims have been amended. No claims have been canceled. No new claims have been added.

Rejections under 35 U.S.C. § 112, first paragraph

The Office Action rejected claims 43-49 under 35 USC 112, first paragraph, as failing to comply with the written description requirement. Specifically, that the limitation of claim 43 of "stores, for each of the plurality of service levels, a representation of every available paths from the source node to other access nodes in said optical network" was cited as not being described in the specification. Applicants respectfully submit that this claim limitation is described by the specification as filed See, for example, paragraph 0070: "As another example, each access node may store may store network topology database(s) representing: service level topologies for the network, service level topologies for that node, one or more conversion free topologies for that node, and/or conversion free service level topologies for that node."

The Office Action rejected claims 50-56 under 35 USC 112, first paragraph, as failing to comply with the written description requirement. Specifically, that the limitation of claim 50 of "stores, for each of the plurality of service levels, a representation of every available paths from the source node to other access nodes in said optical network" was cited as not being described in the specification. Applicants respectfully submit that this claim limitation is described by the specification as filed See, for example, paragraph 0070: "As another example, each access node may store may store network topology database(s) representing: service level topologies for the network, service level topologies for that node, one or more conversion free topologies for that node, and/or conversion free service level topologies for that node."

Rejections under 35 U.S.C. § 103(a)

The Office Action rejected claims 1-3 and 5-6 under 35 U.S.C. § 103(a) as being unpatentable over Golmie et al., "A Differentiated Optical Services Model for WDM Networks" (hereinafter "Golmie") in view of Assi et al., "Optical Networking and Real-Time Provisioning: An integrated Vision for the Next-Generation Internet" (hereinafter "Assi") and Kodialam et al., US Patent Application Publication No. 2002/0018264 A1 (hereinafter "Assi").

Golmie describes "a QoS service model in the optical domain ... based on a set of optical parameters that captures the quality and reliability of the optical lightpath." (Golmie, Abstract and Table 1.) An optical lightpath being "an optical communication channel, traversing one or more optical links, between a source-destination pair." (Golmie, Page 69, Left column.) Golmie classifies lightpaths (not wavelengths or paths) based on QoS and these classes for example "consist[] of three alternate lightpaths between a single source-destination pair accessible at the WADM, each with a unique DoS class, labeled class 1, class 2, and class 3, containing wavelength groups (λ_1, λ_2), (λ_3, λ_4), and (λ_5, λ_6) respectively... All lightpaths in a DoS class have equivalent quality of optical service between a source-destination pair." (Golmie, page 72, Left column.) Golmie does not describe determining service level topologies. (See Office Action, page 3.)

Assi describes two dynamic algorithms to help with the so-called "routing and wavelength assignment (RWA) problem." (Assi, page 38, right column.) In both algorithms, a network with multiple nodes/OXCs (without wavelength conversion) is interconnected and "all nodes maintain a synchronized and identical topology and link state information (traffic engineering database, TED)." (Assi, page 39, right column.) "[T]he network is represented by W identical graphs, each conforming to the physical topology and a particular wavelength." (Assi, page 40, left column.) "For a given connection request, a constraint route is calculated, for each of the wavelength graphs,

throughout the entire network from source to destination, typically using a shortest path algorithm but with link weights adjusted to attain some sort of local resource optimization." (Assi, page 40, left column.) Accordingly, each node of the network has the same physical topology database for the network. These nodes do not store what paths or wavelengths are available from a given node's perspective. Rather, in response to a connection request, all of the different paths from a source node to a destination node are calculated on the fly and the best path chosen from the calculated paths.

Kodialam describes "dynamic routing (IDR) of service level (e.g., bandwidth) guaranteed paths for network tunnel paths..." (Kodialam, Abstract.) "IDR determines whether to route an arriving request for a network tunnel path over the existing topology or to open a new, available optical wavelength path." (Kodialam, Abstract.) "[E]ach LSP [label switched path] determined route is computed at the local ingress router without communication with a domain or area wide router-server in communication with all routers of the nodes in the network....In employing OSPF and its extension, the topology information may be derived from the link sate database, with residual capacities derived using messaging and signaling methods..." (Kodialam, Paragraph 0041.) The network of Kodialam may have OXCs with or without wavelength conversion capability. (Kodialam, Paragraphs 0045-0046.)

Thus, the combination of Golmie, Kodialam, and Assi is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node.

Thus, this combination does not describe:

> applying a set of one or more connectivity constraints that include quality of service (QoS) based criteria on a physical network topology of a wave length division multiplexing optical network to divide said optical network into separate service levels; and
> determining service level topologies for each of said service levels for each node in the optical network.

As stated in the Office Action, Golmie does not describe maintaining service level connectivity based on a conversion criteria. (Office Action, Page 3.) Kodialam simply describes that a network could have either conversion free OXCs or conversion OXCs. Assi describes adaptive routing solutions in a conversion free network. Neither Kodialam nor Assi relate their concepts to a service level.

Accordingly, the combination of Golmie, Kodialam, and Assi does not describe what Applicants' claim 1 requires. Claims 2-6 are dependent upon claim 1 and are therefore allowable for at least the same reason.

The Office Action rejected claims 7-9 under 35 U.S.C. § 103(a) as being unpatentable over Golmie in view of Kodialam et al., US Patent Application Publication No. 2002/0018264 (hereinafter "Kodialam"). The combination of Golmie and Kodialam does not describe what Applicants are claiming.

Thus, the combination of Golmie and Kodialam is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine physical network topologies for the entire system. This combination does not describe "maintaining in each node of a wave length division multiplexing optical network a classification by QoS criteria of wavelengths for each link of the wave length division multiplexing optical network, said QoS criteria defining a

plurality of service levels; and for each of said plurality of service levels, maintaining service level connectivity from each node to other nodes of the wave length division multiplexing optical network based on a conversion criteria." As stated in the Office Action, Golmie does not describe maintaining service level connectivity based on a conversion criteria. (Office Action, Page 3.) Kodialam simply describes that a network could have either conversion free OXCs or conversion OXCs. It does not relate this concept to a service level.

Accordingly, the combination of Golmie and Kodialam does not describe what Applicants require in claim 7. Claims 8-13 are dependent upon claim 7 and are therefore allowable for at least the same reason.

The Office Action rejected claims 18-21, 24-25, 31-32, 34, 43-47, and 49 under 35 U.S.C. § 103(a) as being unpatentable over Golmie in view of Assi and Kodialam.

The combination of Golmie, Kodialam, and Assi is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node.

The combination does not describe what Applicants' claim 18 requires. Specifically, it does not describe "for each wavelength on each link of a wavelength division multiplexing optical network, a wavelength parameter for each of a set of QoS based criteria; for each of a plurality of service levels, a service level parameter for each of said set of QoS based criteria; for each link of said optical network, a link service level

channel set for each of said plurality of service levels representing those of the wavelengths on that link with parameters meeting the service level parameters of that service level; and for each access node of said optical network, a service level topology structure for each of said plurality of service levels representing connectivity of that access node to others of said access nodes using wavelengths from the link service level channel sets of that service level, wherein each access node stores those of said service level topology structures representing connectivity of that access node."

As stated in the Office Action, Golmie does not describe maintaining service level connectivity based on a conversion criteria. (Office Action, Page 3.) Kodialam simply describes that a network could have either conversion free OXCs or conversion OXCs. Assi describes adaptive routing solutions in a conversion free network. Neither Kodialam nor Assi relate their concepts to a service level.

Accordingly, the combination of Golmie, Assi, and Kodialam does not describe what Applicants require in claim 18. Claims 19-23 are dependent upon claim 18 and are therefore allowable for at least the same reason.

With respect to claim 24, the combination of Golmie, Assi, and Kodialam does not describe what Applicant' claim requires.

The combination of Golmie, Kodialam, and Assi is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node.

The combination does not describe "an access node, to be coupled in a wavelength division multiplexing optical network, including, a link state database to store, for each link connected to said access node, a link state structure to store a port of the access node to which that link is connected, available wavelengths on that link, and parameters of those wavelengths; a service level parameter database to store, for each of a set of one or more supported service levels, a service level parameter for each of a set of QoS based criteria; and a service level connectivity database to store, for each of said set of service levels, a service level topology structure that stores a representation of the service level topology of that service level for said access node."

As stated in the Office Action, Golmie does not describe maintaining service level connectivity based on a conversion criteria. (Office Action, Page 3.) Kodialam simply describes that a network could have either conversion free OXCs or conversion OXCs. Assi describes adaptive routing solutions in a conversion free network. Neither Kodialam nor Assi relate their concepts to a service level.

Accordingly, the combination of Golmie, Assi, and Kodialam does not describe what Applicants require in claim 24. Claims 25-30 are dependent upon claim 24 and are therefore allowable for at least the same reason.

With respect to claim 31, the combination of Golmie, Assi, and Kodialam does not describe what Applicants' claim requires.

The combination of Golmie, Kodialam, and Assi is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about

lightpaths separated by class for the entire area and would not be specific to a particular access node.

The combination does not describe "for each link to an adjacent node of said wavelength division multiplexing optical network, said access node classifying wavelengths on that link according to a set of one or more service level parameters for each of a plurality of service levels; for each of said plurality of service levels, instantiate a service level topology structure; and responsive to receiving information regarding connectivity at each of said plurality of service levels to other access nodes in said optical network, adding such information to said service level topology structure for that service level."

As stated in the Office Action, Golmie does not describe maintaining service level connectivity based on a conversion criteria. (Office Action, Page 3.) Kodialam simply describes that a network could have either conversion free OXCs or conversion OXCs. Assi describes adaptive routing solutions in a conversion free network. Neither Kodialam nor Assi relate their concepts to a service level.

Accordingly, the combination of Golmie, Assi, and Kodialam does not describe what Applicants require in claim 31. Claims 32-36 are dependent upon claim 31 and are therefore allowable for at least the same reason.

The Office Action rejected claims 37-38, 40, 50-54, 56, and 71-73 under 35 U.S.C. § 103(a) as being unpatentable over Golmie, Assi, and Kodialam as applied to claims 18-20, 22, 24-25, 31-32, and 34, and further in view of Freeman, "Telecommunication System Engineering" (hereinafter "Freeman"). Freeman describes to store method steps as program memory for providing instructions to a controller or computer.

With respect to claim 37, the combination of Golmie, Assi, Kodialam, and Freeman does not describe what Applicants are claiming.

The combination of Golmie, Kodialam, Assi, and Freeman is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node.

The combination does not describe "for each link to an adjacent node of said wavelength division multiplexing optical network, said access node classifying wavelengths on that link according to a set of one or more service level parameters for each of a plurality of service levels; for each of said plurality of service levels, instantiate a service level topology structure; and responsive to receiving information regarding connectivity at each of said plurality of service levels to other access nodes in said optical network, adding such information to said service level topology structure for that service level."

As stated in the Office Action, Golmie does not describe maintaining service level connectivity based on a conversion criteria. (Office Action, Page 3.) Kodialam simply describes that a network could have either conversion free OXCs or conversion OXCs. Assi describes adaptive routing solutions in a conversion free network. Neither Kodialam nor Assi relate their concepts to a service level.

Accordingly, the combination of Golmie, Assi, Kodialam, and Freeman does not describe what Applicants require in claim 37. Claims 38-42 are dependent upon claim 37 and are therefore allowable for at least the same reason.

With respect to claim 50, the combination of Golmie, Assi, Kodialam, and Freeman does not describe what Applicants are claiming.

The combination of Golmie, Kodialam, Assi, and Freeman is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node.

The combination does not describe:

> responsive to receiving a request for a communication path starting at a source node in an wavelength division multiplexing optical network, selecting a first of a plurality of service levels, wherein different wavelengths on at least certain links of said optical network qualifying for different ones of said plurality of service levels forms a different service level topology for each of said plurality of service levels for each access node of said optical network;
>
> selecting a path and a wavelength on said path using a database that stores, for each of the plurality of service levels, a representation of available paths from the source node to other access nodes in said optical network and a separate service level topology structure for each of said service level topologies of said source node, wherein each path is a series of two or more nodes connected by links having a set of one or more wavelengths at the same service level; and
>
> causing allocation of the selected wavelength in the series of nodes of the selected path.

As stated in the Office Action, Golmie does not describe maintaining service level connectivity based on a conversion criteria. (Office Action, Page 3.) Kodialam simply

describes that a network could have either conversion free OXCs or conversion OXCs. Assi describes adaptive routing solutions in a conversion free network. Neither Kodialam nor Assi relate their concepts to a service level.

Accordingly, the combination of Golmie, Assi, Kodialam, and Freeman does not describe what Applicants require in claim 50. Claims 51-53 and 55-56 are dependent upon claim 50 and are therefore allowable for at least the same reason.

The Office Action rejected claims 30 and 57-60 under 35 U.S.C. § 103(a) as being unpatentable over Golmie, Assi, and Kodialam in view of Melaku et al., US Patent Publication No. 2003/0074443 (hereinafter "Melaku").

Melaku describes rerouting traffic to a different path based on a change in QoS requirements. (Melaku, Paragraph 0056.) "If the user decides to change QoS requirements in the midst of a session, the LMQB [Last Mile QoS Broker] dynamically updates the database [of the LMQB] and re-allocates new resources and establishes a path that meets the requested quality of service." (Melaku, Paragraph 0056.)

The combination of Golmie, Kodialam, Assi, and Melaku is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node.

The combination of Golmie, Assi, Kodialam, and Melaku does not describe what Applicants require in claim 57. Specifically, the combination does not describe:

receiving a request to change a service provisioned with a communication path established in a wavelength division multiplexing optical network at one of a plurality of service levels to a different one of said plurality of service levels, wherein different wavelengths on at least certain links of said optical network qualifying for different ones of said plurality of service levels forms a different service level topology for each of said plurality of service levels for each access node of said optical network;

selecting a path and a wavelength on said path using a database that stores, for each of the plurality of service levels, a representation of available paths from a source node of said communication path to other access nodes in said optical network and a separate service level topology structure for each of said service level topologies of said source node, wherein each path is a series of two or more nodes connected by links having a set of one or more wavelengths at the same service level;

causing allocation of the selected wavelength in the series of nodes of the selected path to form a new communication path; and

transitioning said service to the new communication path.

As stated in the Office Action, Golmie does not describe maintaining service level connectivity based on a conversion criteria. (Office Action, Page 3.) Kodialam simply describes that a network could have either conversion free OXCs or conversion OXCs. Assi describes adaptive routing solutions in a conversion free network. Neither Kodialam nor Assi relate their concepts to a service level. Melaku uses a shared database outside of each node.

Accordingly, the combination of Golmie, Assi, Kodialam, and Melaku does not describe what Applicants require in claim 57. Claims 58-60 and 62-63 are dependent upon claim 57 and are therefore allowable for at least the same reason.

The Office Action rejected claims 64-70 under 35 U.S.C. § 103(a) as being unpatentable over Golmie, Assi, Kodialam, and Freeman in view of Melaku as applied to claims 57-60, and further in view of Freeman.

The combination of Golmie, Kodialam, Assi, Freeman, and Melaku is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node. Additionally, this common database may be updated dynamically in each node to reflect QoS changes (each node will note the QoS changes).

The combination does not describe:

> responsive to receiving a request to change a service provisioned with a communication path established in a wavelength division multiplexing optical network at one of a plurality of service levels to a different one of said plurality of service levels, selecting a path and a wavelength on said path using a database that stores, for each of the plurality of service levels, a representation of available paths from a source node of said communication path to other access nodes in said optical network and a separate service level topology structure for each of said service level topologies of said source node, wherein different wavelengths on at least certain links of said optical network qualifying for different ones of said plurality of service levels forms a different service level topology for each of said plurality of service levels for each access node of said optical network, wherein each path is a series of two or more nodes connected by links having a set of one or more wavelengths at the same service level;

causing allocation of the selected wavelength in the series of nodes of the selected path to form a new communication path; and
transitioning said service to the new communication path.

As stated in the Office Action, Golmie does not describe maintaining service level connectivity based on a conversion criteria. (Office Action, Page 3.) Kodialam simply describes that a network could have either conversion free OXCs or conversion OXCs. Assi describes adaptive routing solutions in a conversion free network. Neither Kodialam nor Assi relate their concepts to a service level. Melaku uses a shared database outside of each node. Accordingly, the combination of Golmie, Assi, Kodialam, Freeman and Melaku does not describe what Applicants require in claim 64. Claims 65-67 and 69-70 are dependent upon claim 64 and are therefore allowable for at least the same reason.

The Office Action rejected claims 71-73 and 70 under 35 U.S.C. § 103(a) as being unpatentable over Golmie, Assi, Kodialam, and Freeman.

The combination of Golmie, Kodialam, Assi, and Freeman is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node.

The combination does not describe:
a service level connectivity database for an access node of a wave division multiplexing optical network, wherein each link of said optical network includes a set of zero or

more lamdas for each of a plurality of service levels, each of said plurality of service levels includes a set of zero of more possible end to end paths comprised of a series of one or more links that include one or more lamdas of that service level, wherein the service level connectivity database includes a separate service level topology structure for each of said plurality of service levels, each of said plurality of service level topology structures storing the data for each of the possible end to end paths of that service level that end with said access node, said service level connectivity database including,

for each of the possible end to end paths that end with said access node, data representing,

the series of links of that path; and

the lamdas of that path.

As stated in the Office Action, Golmie does not describe maintaining service level connectivity based on a conversion criteria. (Office Action, Page 3.) Kodialam simply describes that a network could have either conversion free OXCs or conversion OXCs. Assi describes adaptive routing solutions in a conversion free network. Neither Kodialam nor Assi relate their concepts to a service level.

Accordingly, the combination of Golmie, Assi, Kodialam, and Freeman does not describe what Applicants require in claim 71. Claims 72 and 74-75 are dependent upon claim 71 and are therefore allowable for at least the same reason.

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Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

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